"User-Constrained Optical Route Flooding
System and Method"
Applicant: Guo Qiang Wang
Application No. 09/892,569
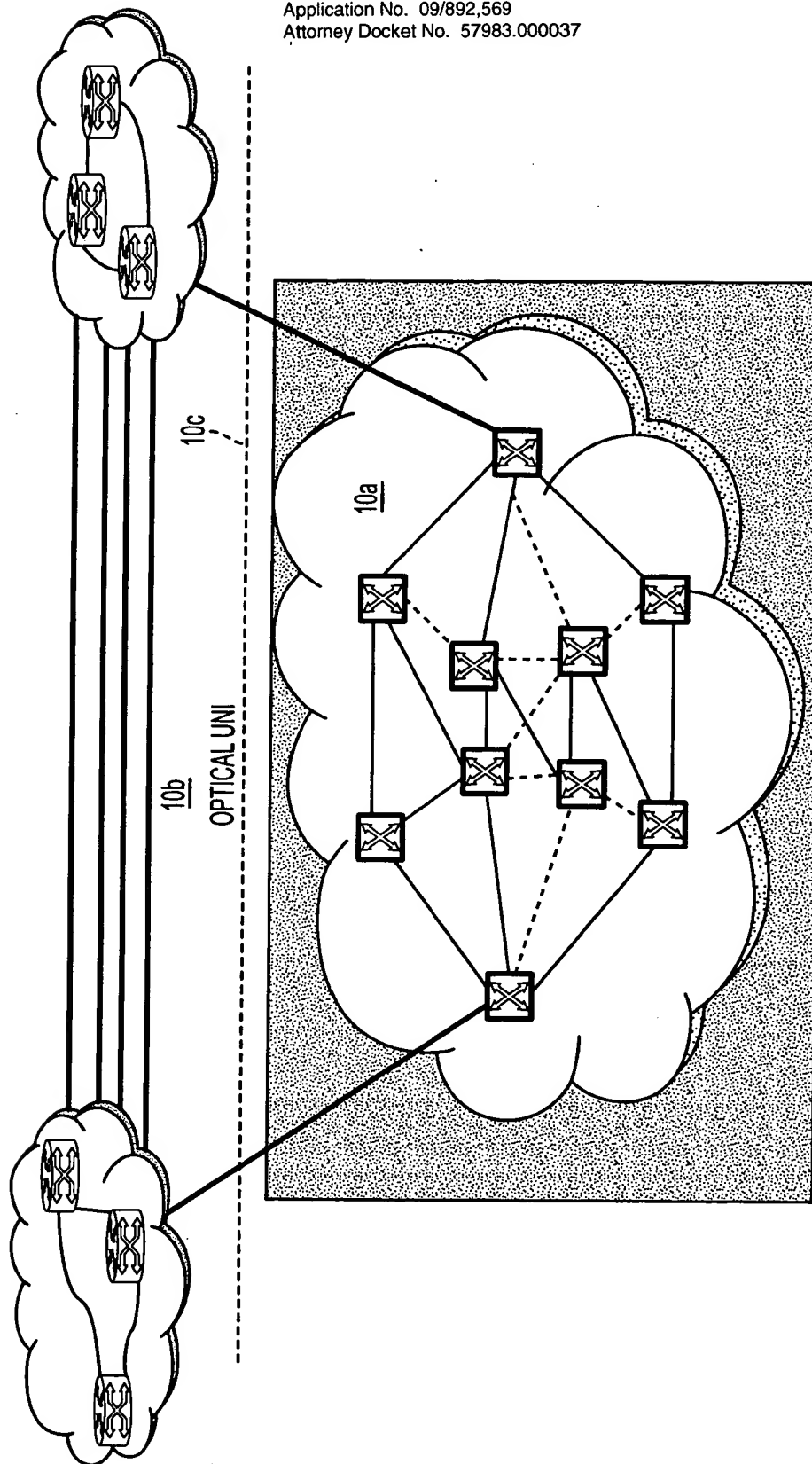Attorney Docket No. 57983.000037

OPTICAL UNI

10a

10b

10c

FIG. 1A

"User-Constrained Optical Route Flooding
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Attorney Docket No. 57983.000037

OPTICAL NNI
11c

11a

11b

FIG. 1B

"User-Constrained Optical Route Flooding
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Applicant: Guo Qiang Wang
Application No. 09/892,569
Attorney Docket No. 57983.000037
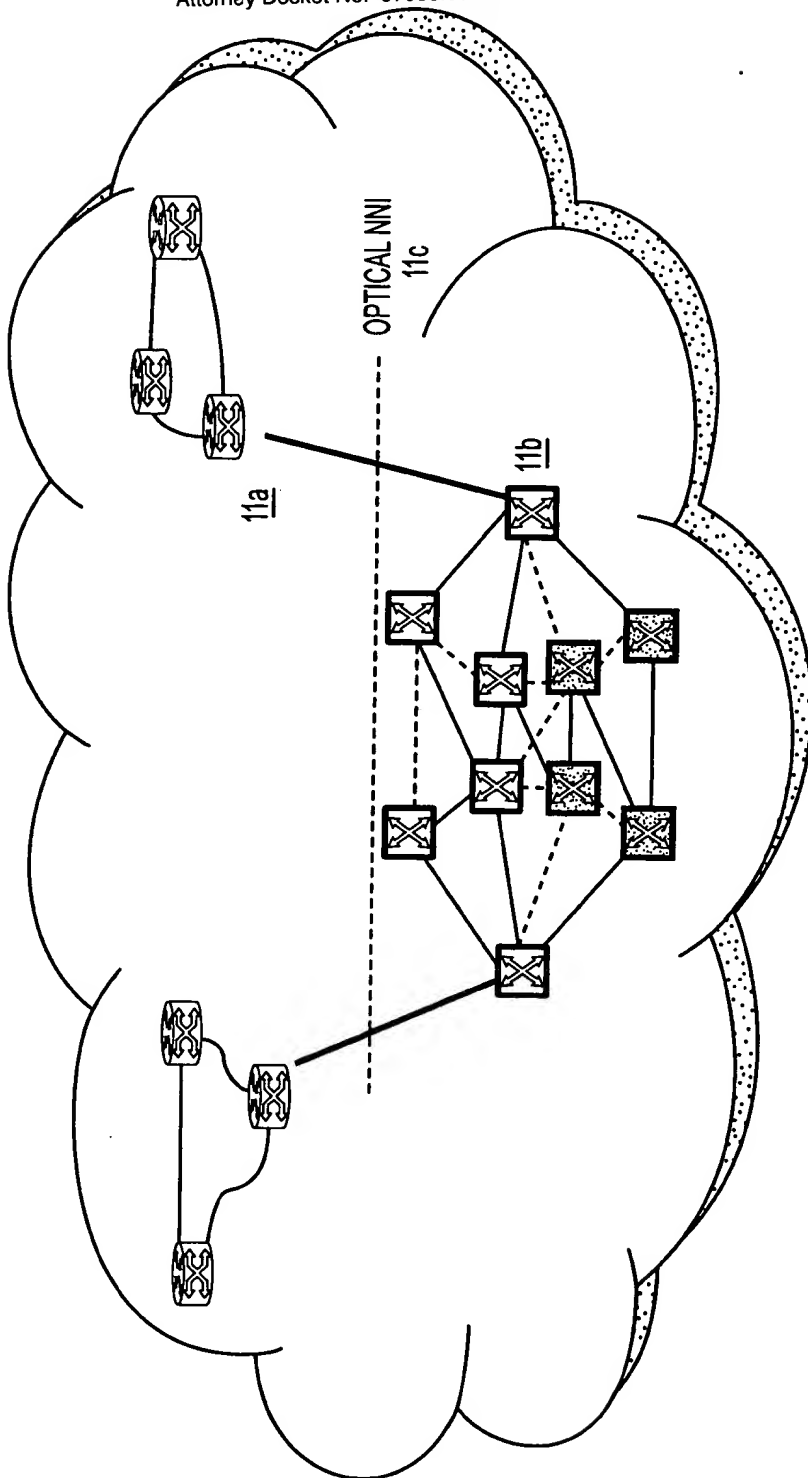
12b

12c

12d

OPTICAL UNI

12a

FIG. 1C

FIG. 2

"User-Constrained Optical Route Flooding
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Application No. 09/892,569
Attorney Docket No. 57983.000037

USER ⟋200

MANAGEMENT PLANE FUNCTION

COMMON
CONTROL
PLANE FUNCTION
(OCC, WRP
WDP)

O B C P
UNI-N

310

OXC NE

300

TMN
INTERFACE

NETWORK

400

SWITCH ⟋700

ROUTER ⟋600

MULTI-
PLEXER ⟋500

UNIC

O B C P

SERVICES

UNI REGISTRATION
ADDRESS RESOLUTION
CONNECTION
INQUIRY

WEB-BASED
PROXY
AGENT

OPTICAL UNI SERVER

100

FIG. 3

FIG. 4

"User-Constrained Optical Route Flooding
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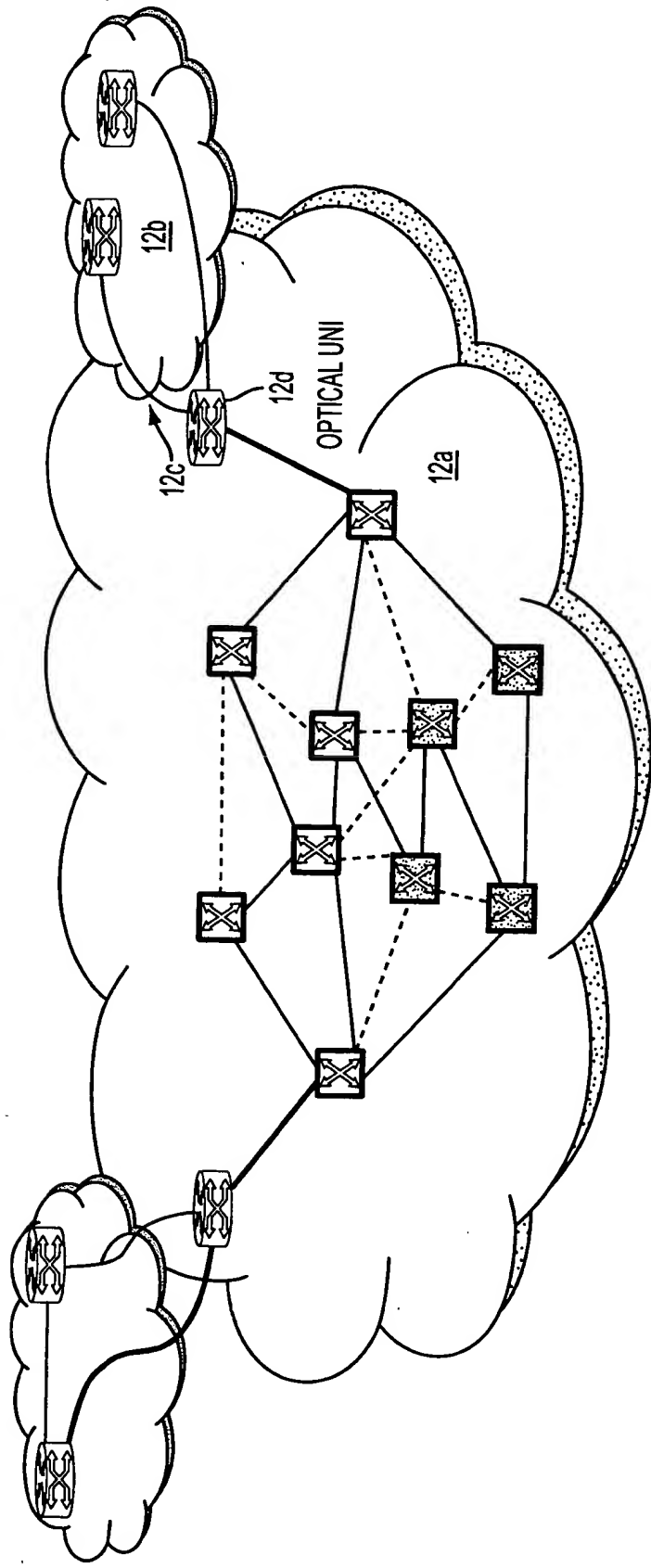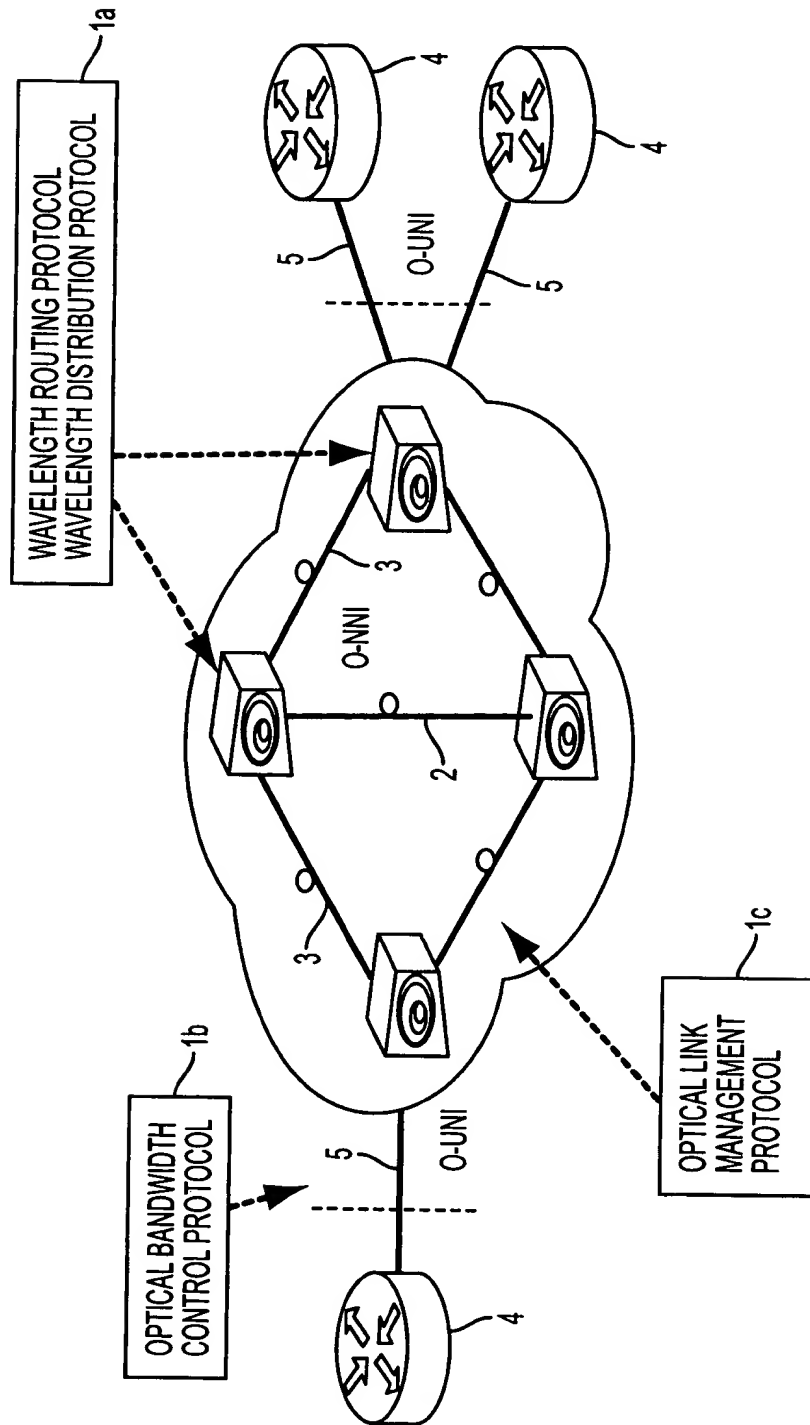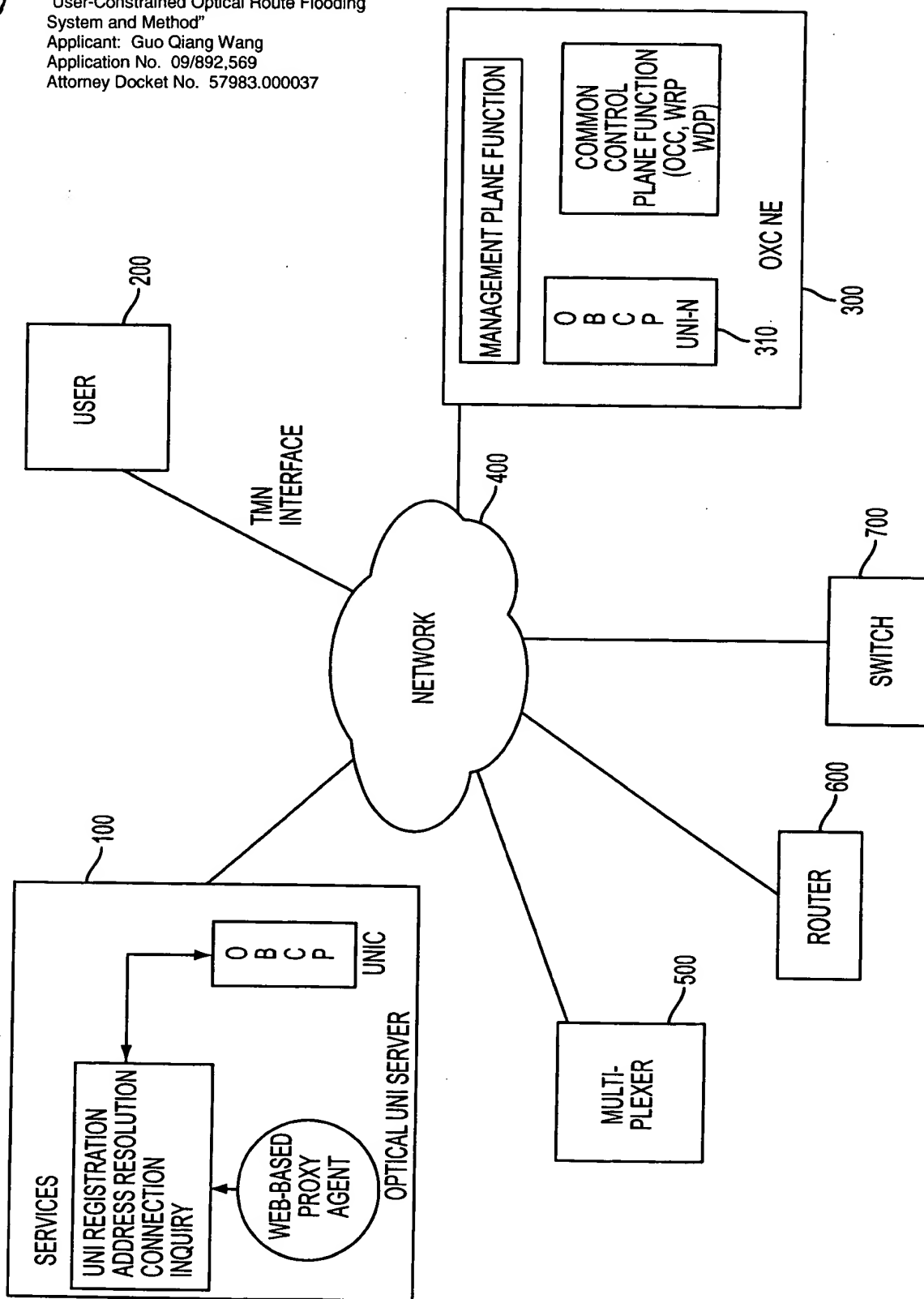Application No. 09/892,569
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FIG. 5

FIG. 6

308 — PORT CARD

Tx

SWITCH CARD

Rx

305

PARALLEL CABLE

302

FIG. 7

LINUX

340

OLMP

310

OBCP

330

WRP/WDP

SWITCH DRIVER

320

ETHERNET

315

INTERNET

400

OPTICAL INTERFACE DESCRIPTOR 110	USER TERMINATION POINT 112
	USER GROUP ID 114
	USER CONTRACT ID 116
	USER SERVICE MODE 118
OPTICAL LINK ADMINISTRATIVE DOMAIN 120	CUSTOMIZED-LINK RELATED (LINK COLOR) 122
	BROADCAST 123
	BLOCK (DEFAULT) 124
	OPTICAL INTERFACE DESCRIPTOR 125
SERVICE LSA 130	OPTICAL INTERFACE DESCRIPTOR TLV 132 INCLUDING
	USER SERVICE TYPE (ATM, IP, ETC.)
	CONTROL PROTOCOL (BGP, PNNI, ETC.)
	FRAMING PROTOCOL (GE, OX-c, FIBER CHANNEL, ETC., LINK COLOR)
	LINK COLOR
	OPTICAL INTERFACE DESCRIPTOR

FIG. 8

O-UNI

SERVICE LSA

70

2

OPTICAL LSA

80

2

O-UNI

SERVICE LSA

70

FIG. 9

"User-Constrained Optical Route Flooding
System and Method"
Applicant: Guo Qiang Wang
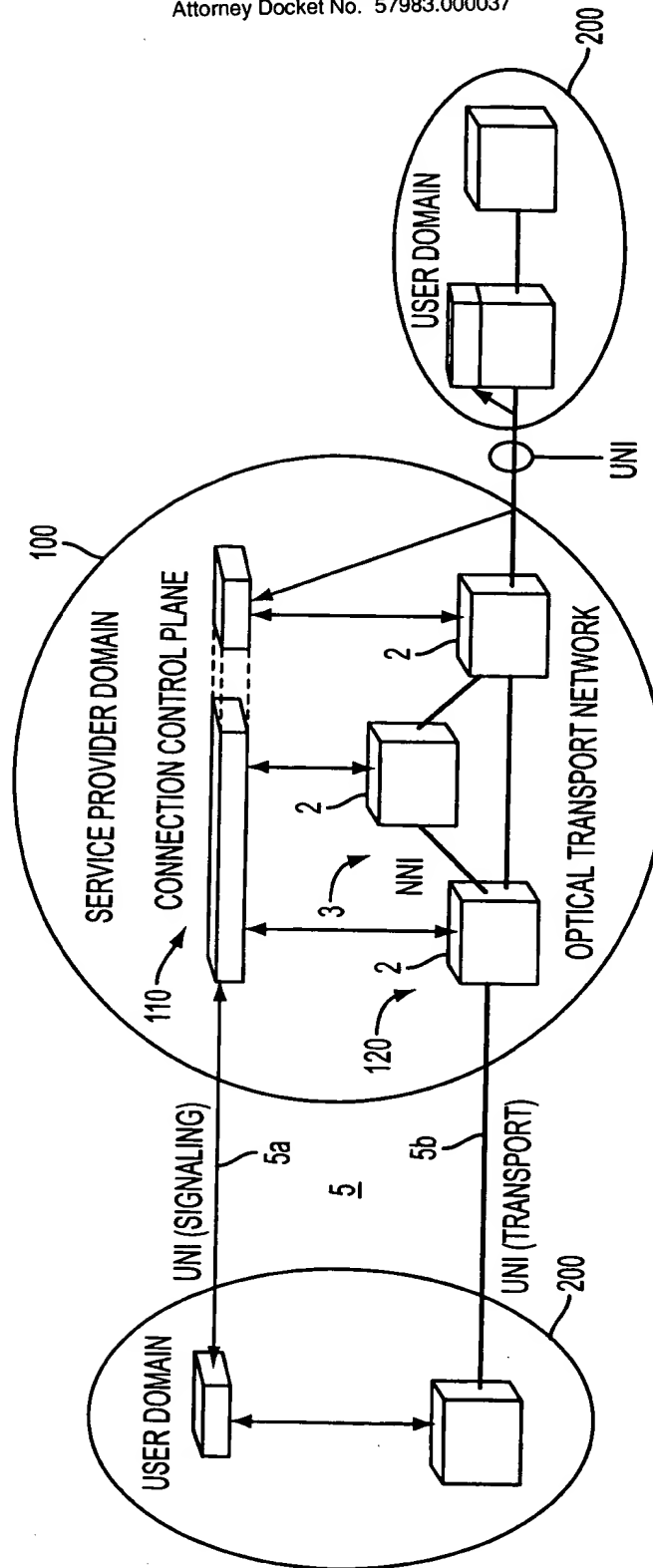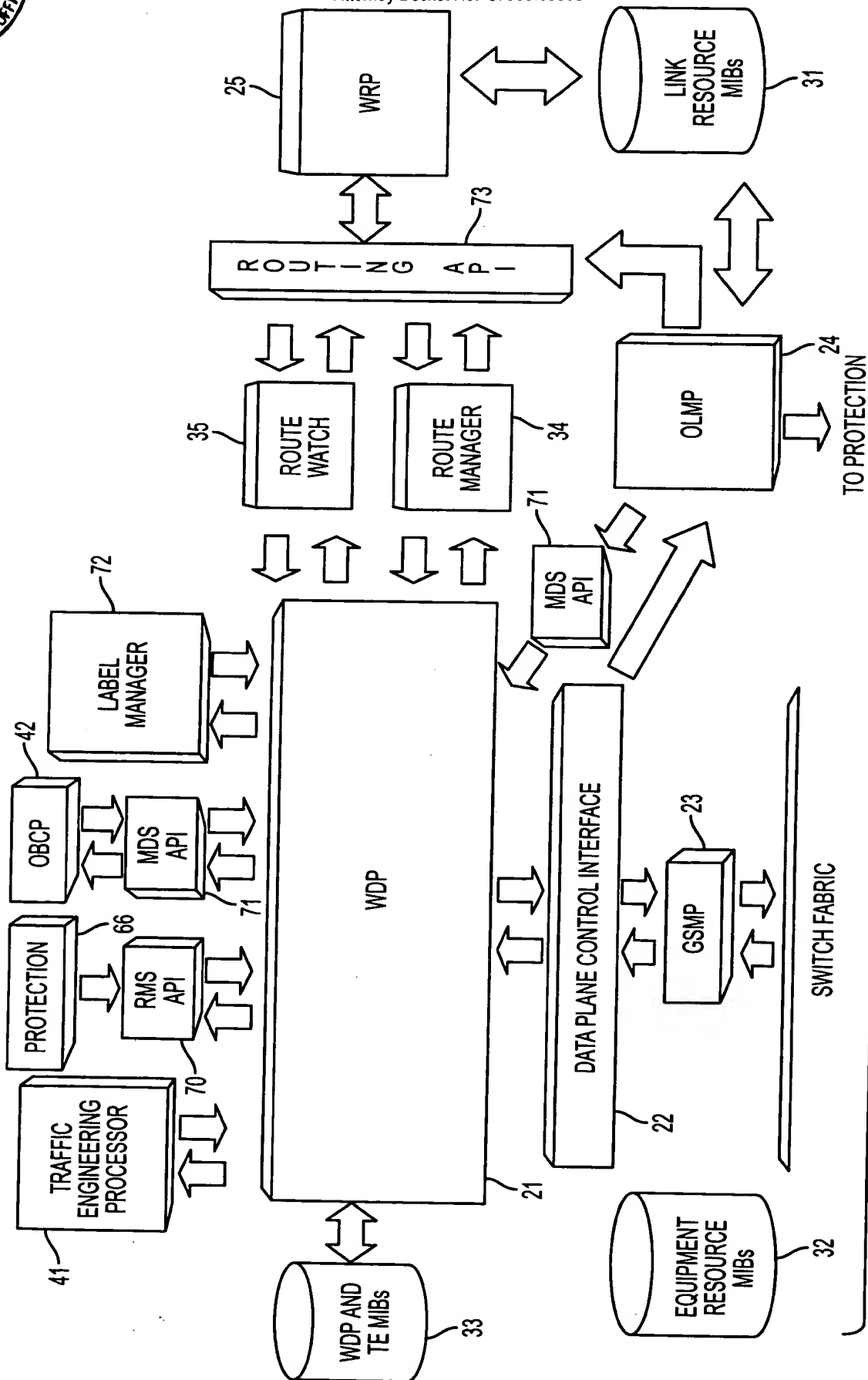Application No. 09/892,569
Attorney Docket No. 57983.000037

OPC

73

UNI

C

72

WRP_Service_LSA

70

WRP_Service_LSA

70

NNI

B

71

WRP_Optical_LSA

80

WRP_Optical_LSA

80

WRP_Service_LSA

70

WRP_Service_LSA

70

UNI

A

68

MUX
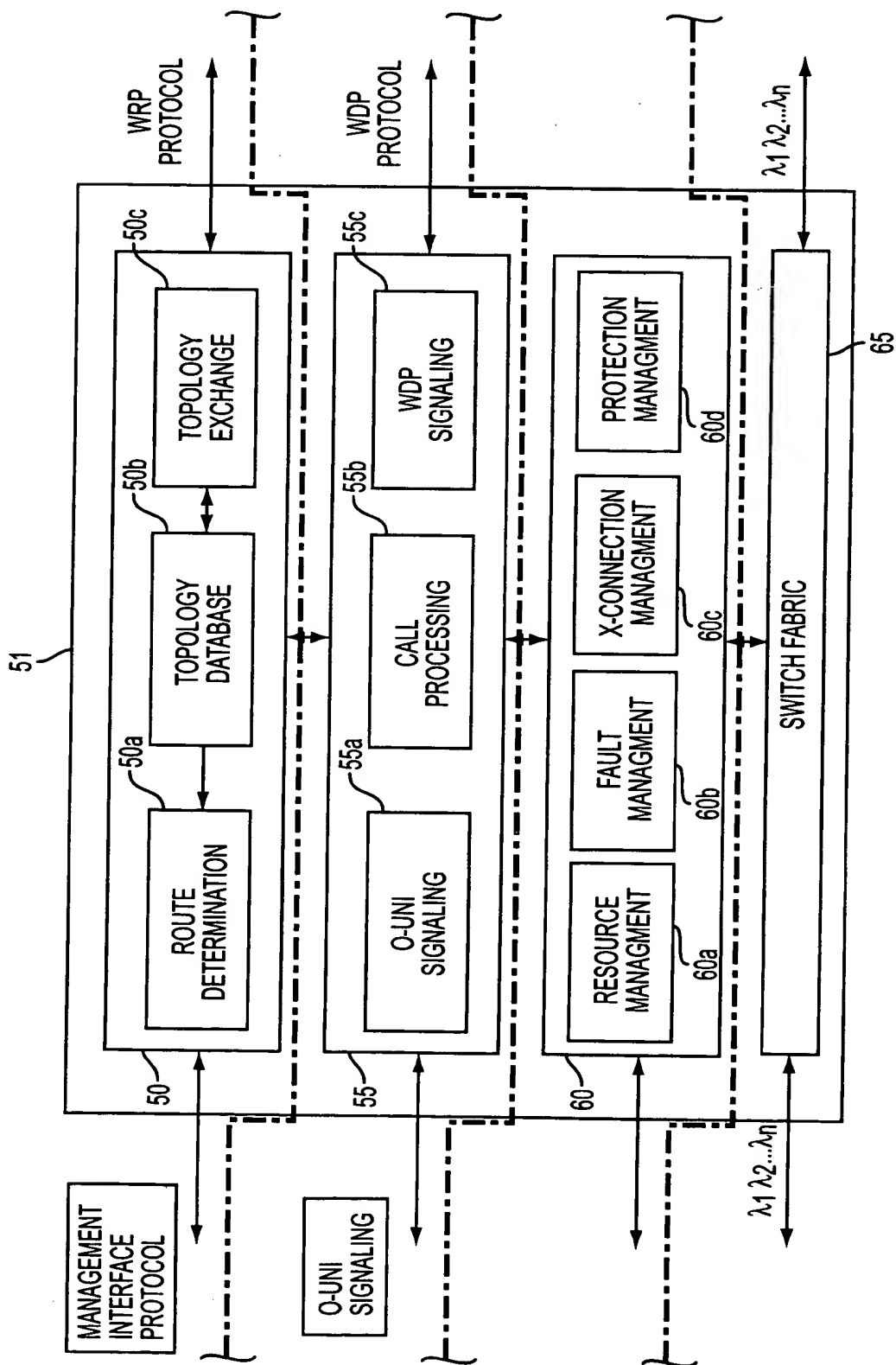
WRP_Service_LSA
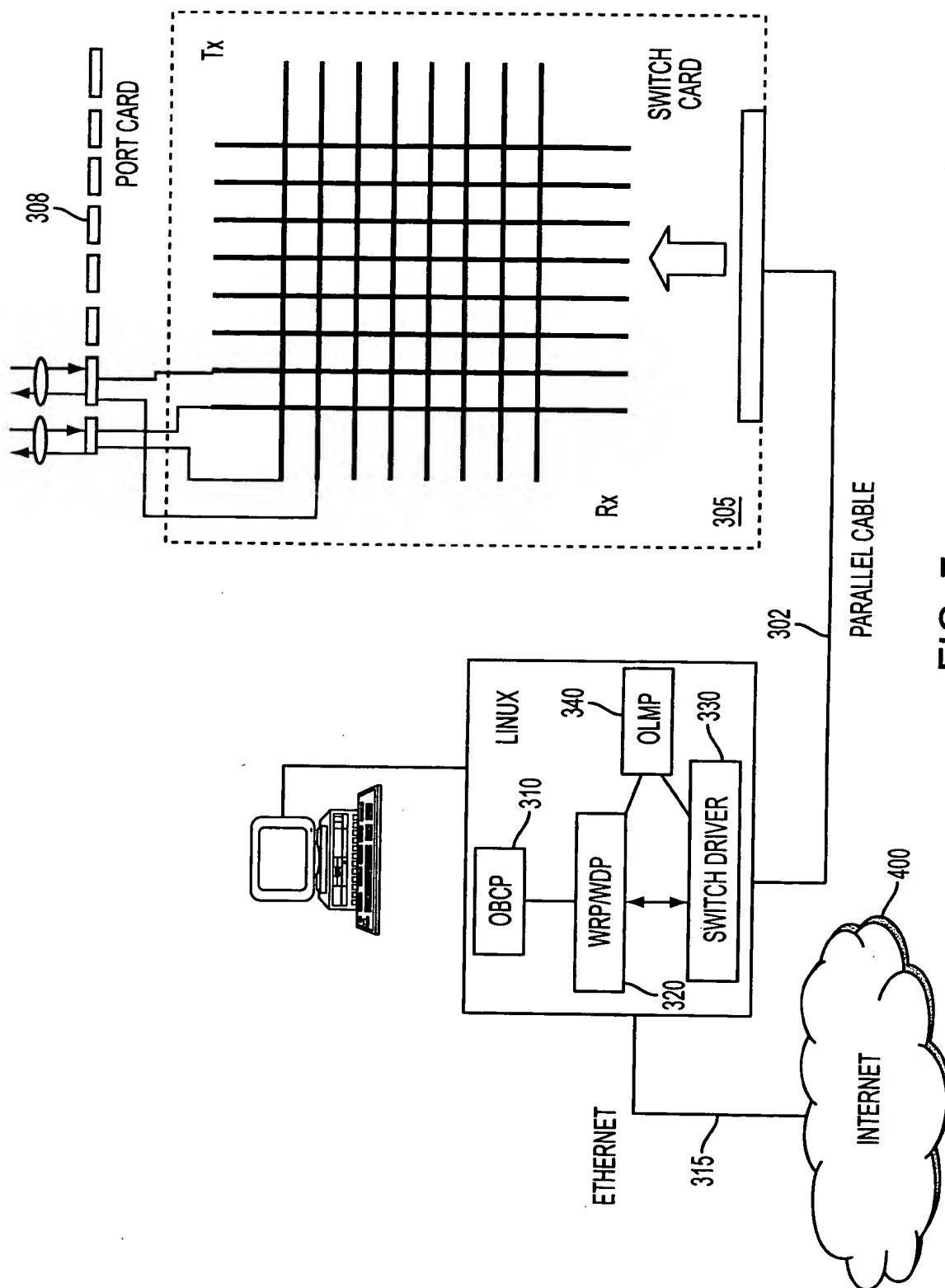
70

WRP_Service_LSA

70

FIG. 10

"User-Constrained Optical Route Flooding
System and Method"
Applicant: Guo Qiang Wang
Application No. 09/892,569
Attorney Docket No. 57983.000037

OPC

73

UNI   C   72

UNI_connect   83

UNI_confirm   84

NNI   B   71

WDP_connect   82

WDP_label-mapping   85

UNI   A

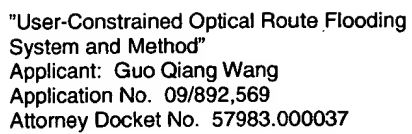UNI_connect   81

UNI_confirm   86

MUX   68

FIG. 11

"User-Constrained Optical Route Flooding
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Applicant: Guo Qiang Wang
Application No. 09/892,569
Attorney Docket No. 57983.000037

PRIVATE OPTICAL NETWORK

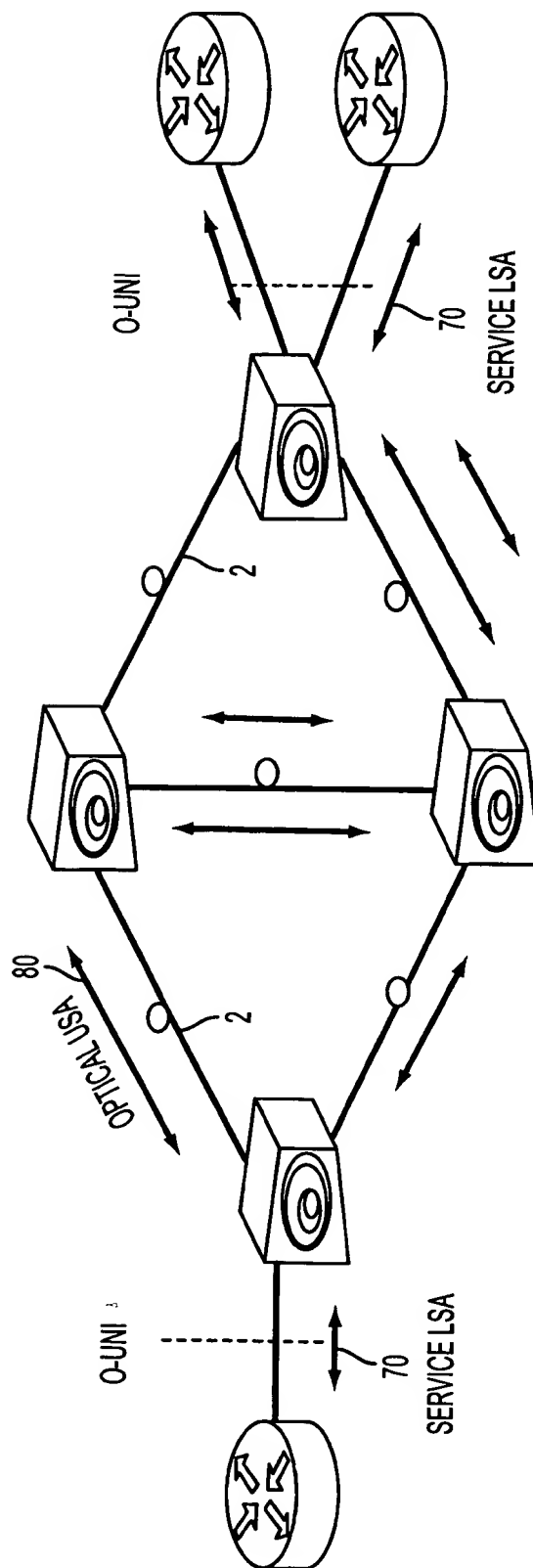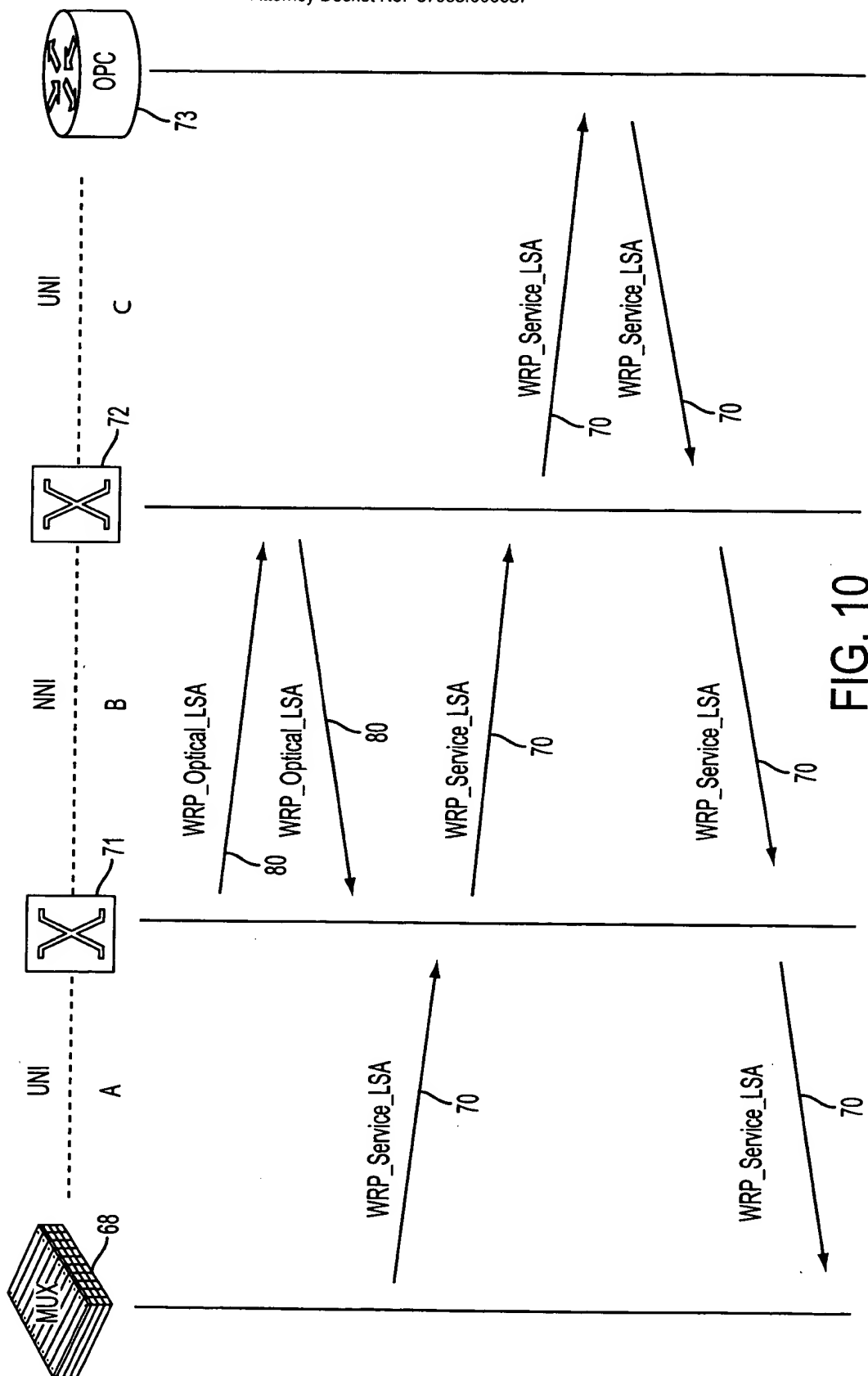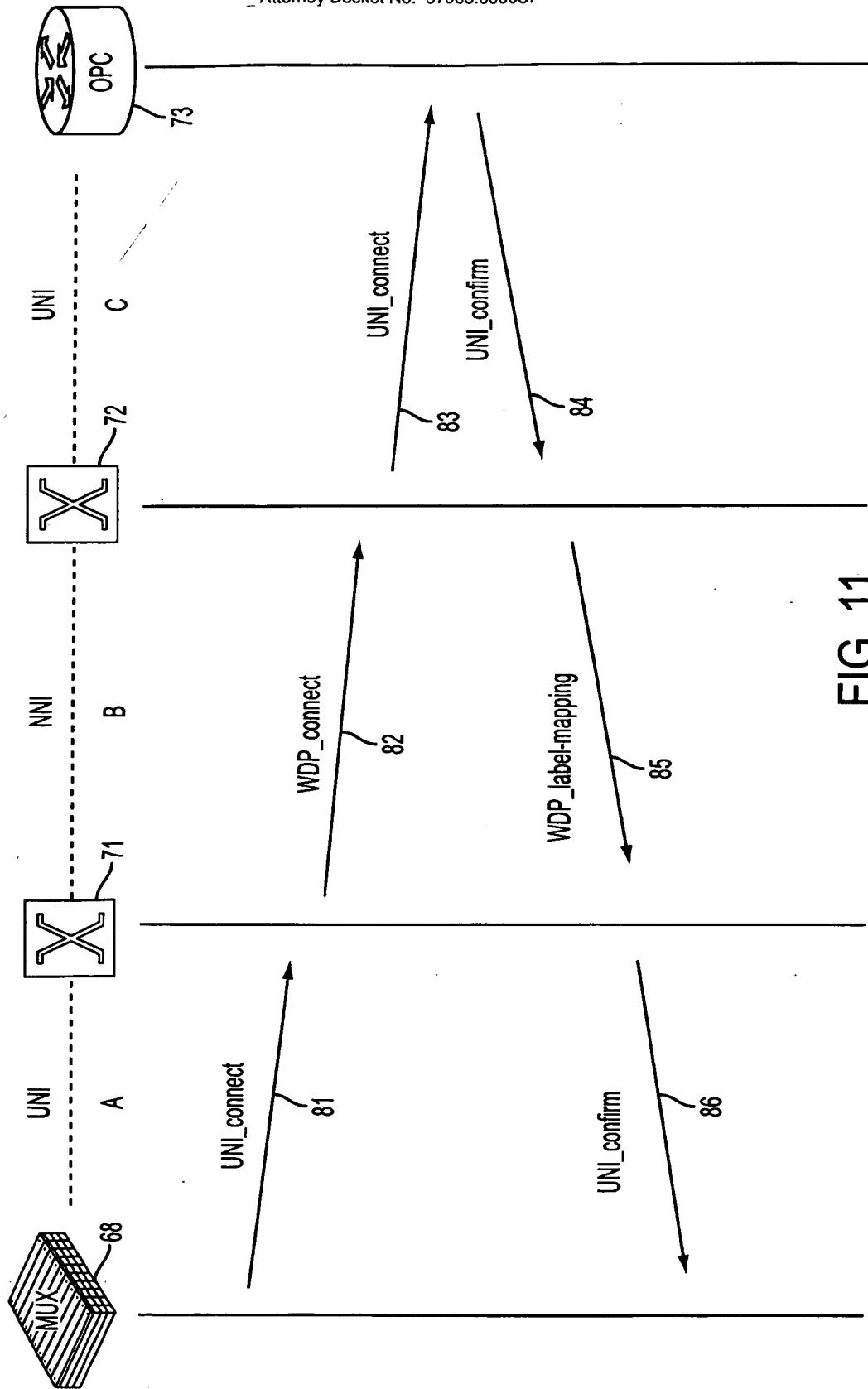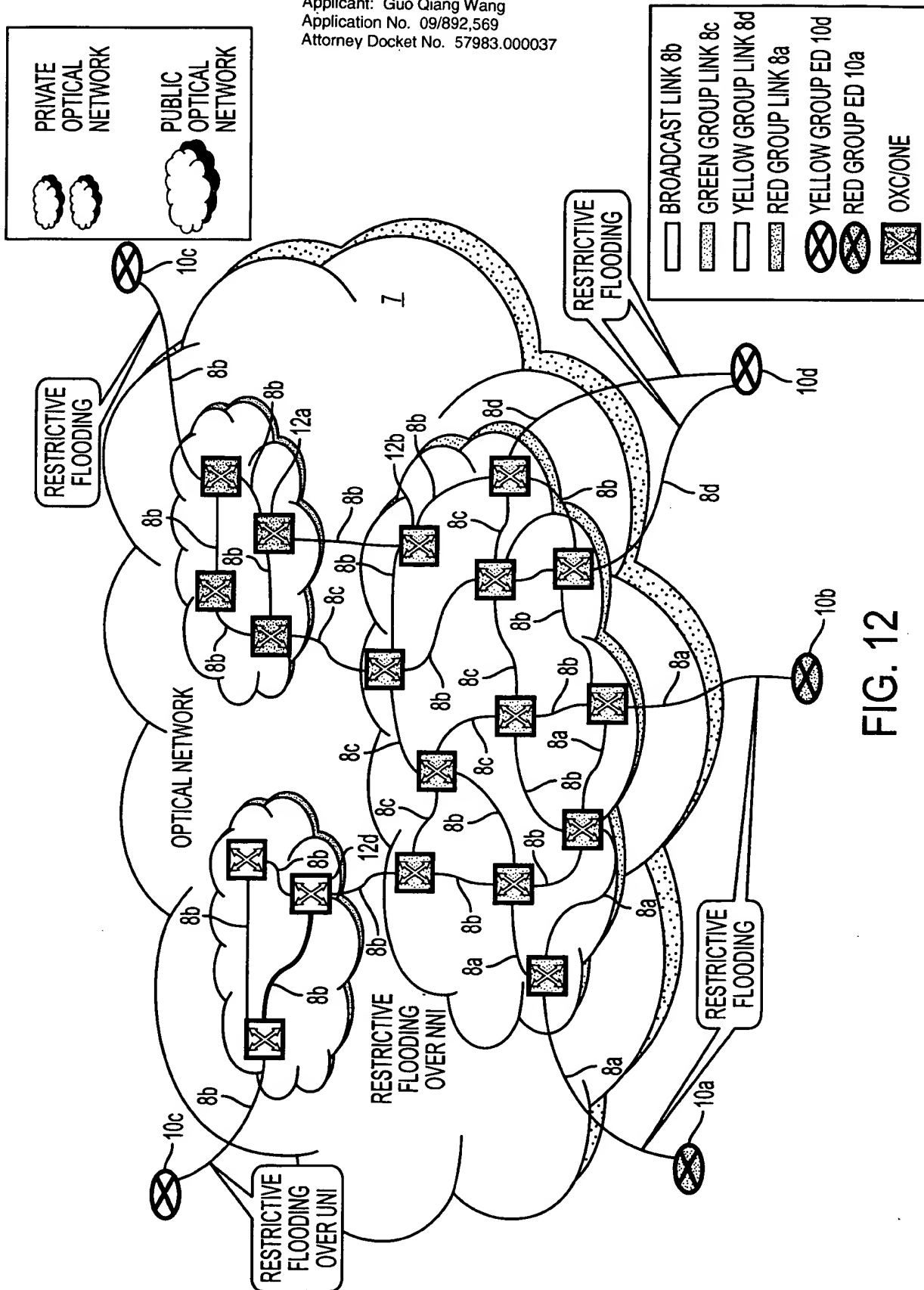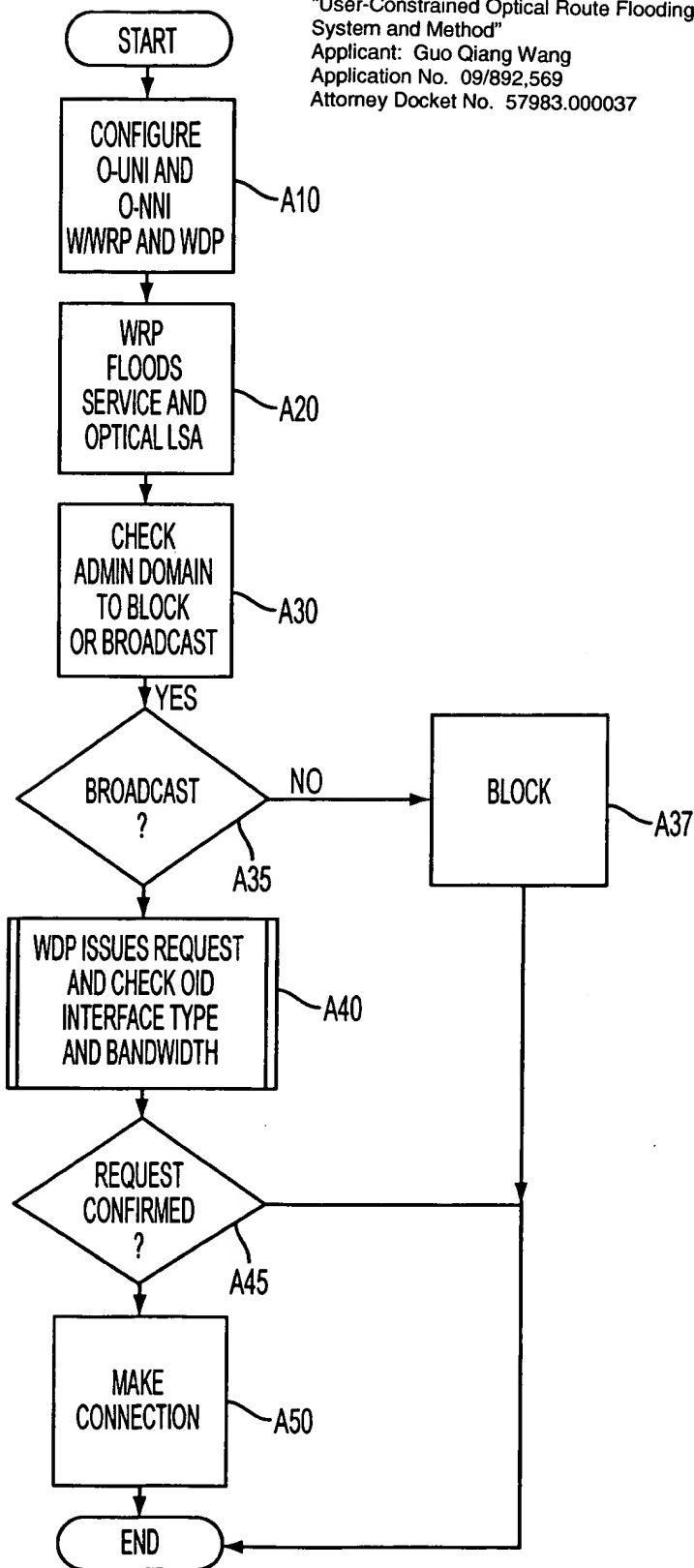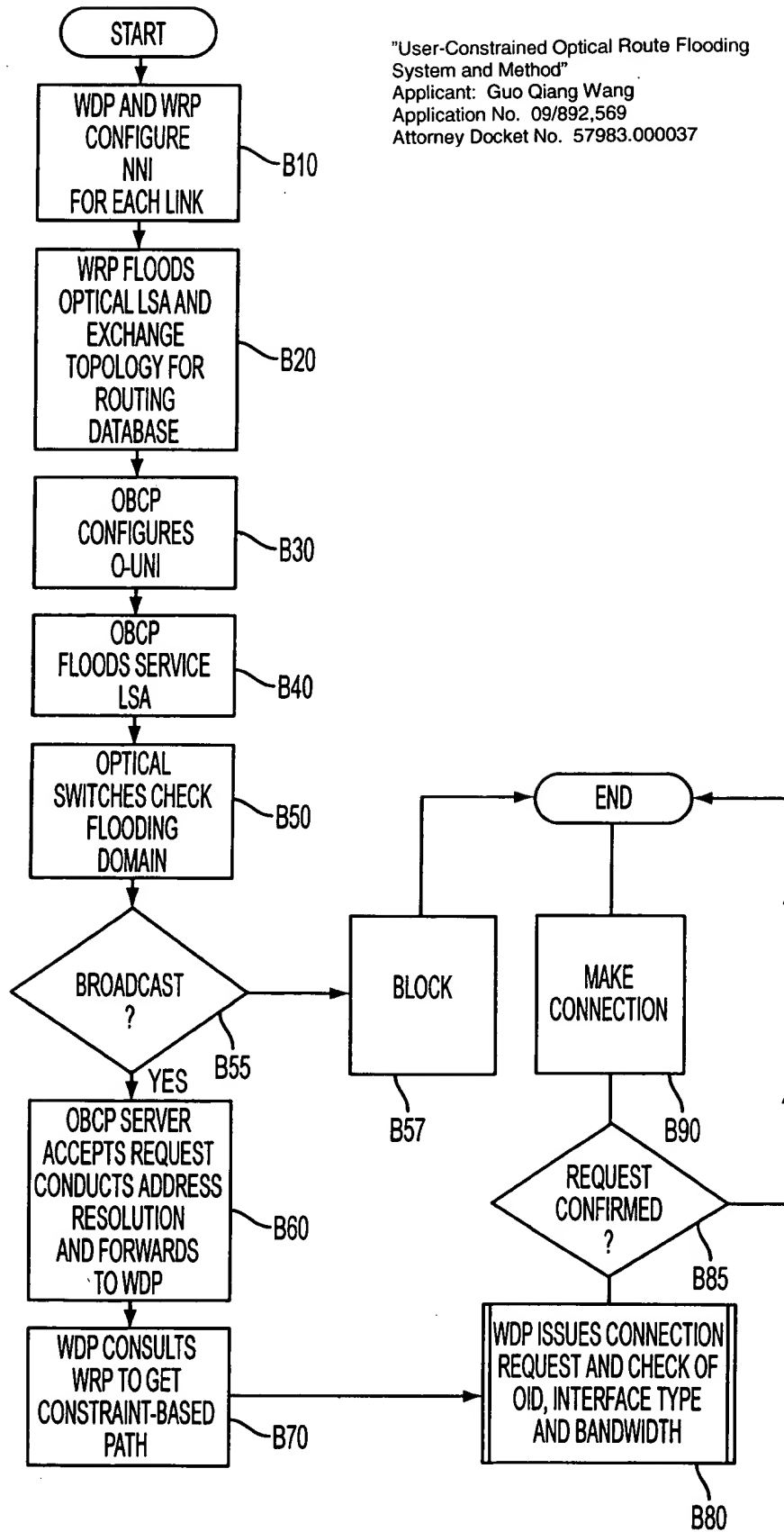PUBLIC OPTICAL NETWORK

BROADCAST LINK 8b
GREEN GROUP LINK 8c
YELLOW GROUP LINK 8d
RED GROUP LINK 8a
YELLOW GROUP ED 10d
RED GROUP ED 10a
OXC/ONE

RESTRICTIVE FLOODING

OPTICAL NETWORK

RESTRICTIVE FLOODING OVER NNI

RESTRICTIVE FLOODING OVER UNI

FIG. 12

```
        ┌─────────┐
        │  START  │
        └─────────┘
             │
             ▼
     ┌──────────────┐
     │  CONFIGURE   │
     │  O-UNI AND   │
     │  O-NNI       │──── A10
     │ W/WRP AND WDP│
     └──────────────┘
             │
             ▼
     ┌──────────────┐
     │     WRP      │
     │    FLOODS    │
     │  SERVICE AND │──── A20
     │  OPTICAL LSA │
     └──────────────┘
             │
             ▼
     ┌──────────────┐
     │    CHECK     │
     │ ADMIN DOMAIN │
     │   TO BLOCK   │──── A30
     │ OR BROADCAST │
     └──────────────┘
             │ YES
             ▼
          ◇─────◇
        ◇         ◇                      ┌──────────┐
       ◇ BROADCAST ◇    NO               │          │
       ◇    ?      ◇ ──────────────────► │  BLOCK   │──── A37
        ◇         ◇                      │          │
          ◇─────◇                        └──────────┘
             │  A35                            │
             ▼                                 │
     ┌──────────────┐                          │
     │WDP ISSUES REQUEST│                      │
     │ AND CHECK OID │                         │
     │ INTERFACE TYPE│──── A40                  │
     │ AND BANDWIDTH │                          │
     └──────────────┘                          │
             │                                 │
             ▼                                 │
          ◇─────◇                              │
        ◇         ◇                            │
       ◇  REQUEST  ◇ ──────────────────────────┤
       ◇ CONFIRMED ◇                           │
       ◇    ?      ◇                           │
        ◇         ◇                            │
          ◇─────◇  A45                         │
             │                                 │
             ▼                                 │
     ┌──────────────┐                          │
     │    MAKE      │                          │
     │  CONNECTION  │──── A50                   │
     └──────────────┘                          │
             │                                 │
             ▼                                 │
        ┌─────────┐                            │
        │   END   │ ◄──────────────────────────┘
        └─────────┘
```

FIG. 13

START

WDP AND WRP CONFIGURE NNI FOR EACH LINK — B10

WRP FLOODS OPTICAL LSA AND EXCHANGE TOPOLOGY FOR ROUTING DATABASE — B20

OBCP CONFIGURES O-UNI — B30

OBCP FLOODS SERVICE LSA — B40

OPTICAL SWITCHES CHECK FLOODING DOMAIN — B50

BROADCAST ? — B55

YES

OBCP SERVER ACCEPTS REQUEST CONDUCTS ADDRESS RESOLUTION AND FORWARDS TO WDP — B60

WDP CONSULTS WRP TO GET CONSTRAINT-BASED PATH — B70

BLOCK — B57

MAKE CONNECTION — B90

END

REQUEST CONFIRMED ? — B85

WDP ISSUES CONNECTION REQUEST AND CHECK OF OID, INTERFACE TYPE AND BANDWIDTH — B80

"User-Constrained Optical Route Flooding
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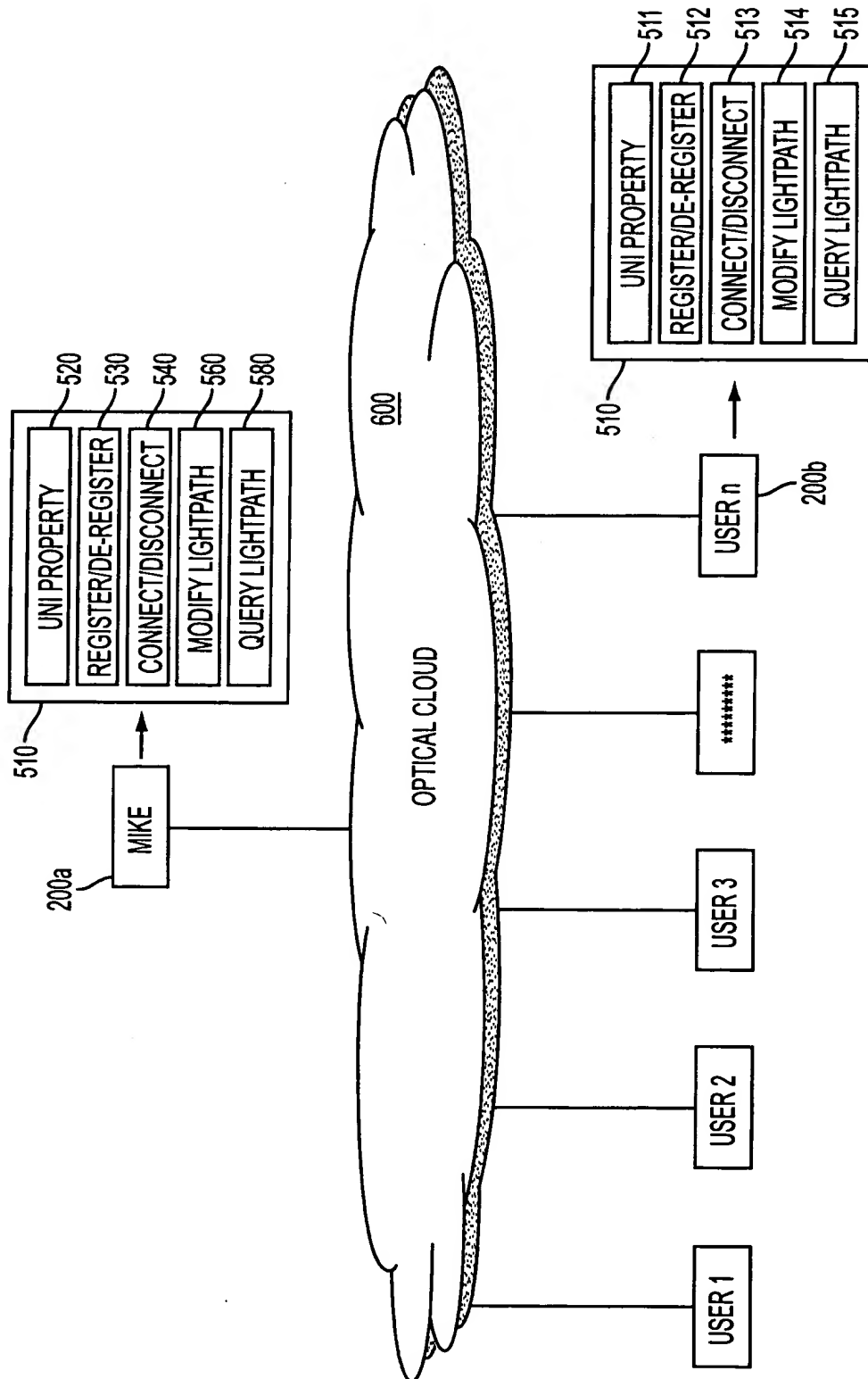Application No. 09/892,569
Attorney Docket No. 57983.000037

FIG. 14

SERVICE MODE	SERVICE LSA	OPTICAL LSA	OTHER LSA
_A_	_B_	_C_	_D_
NONE (0)	BLOCK	BLOCK	BLOCK
_A0_	_B0_	_C0_	_D0_
OVERLAY MODE (1)	FLOODING	BLOCK	BLOCK
_A1_	_B1_	_C1_	_D1_
AUGMENTED MODE (2)	FLOODING	FLOODING	BLOCK
_A2_	_B2_	_C2_	_D2_
PEER-TO-PEER MODE (3)	FLOODING	FLOODING	FLOODING
_A3_	_B3_	_C3_	_D3_

FIG. 15

<u>500</u>

User Name	Mike ~501
User Password	************ ~502
UNI Server	Kanata ▽ ~503

OK ~504   Cancel ~505

FIG. 16

UNI PROPERTY	511
REGISTER/DE-REGISTER	512
CONNECT/DISCONNECT	513
MODIFY LIGHTPATH	514
QUERY LIGHTPATH	515

510

UNI PROPERTY	520
REGISTER/DE-REGISTER	530
CONNECT/DISCONNECT	540
MODIFY LIGHTPATH	560
QUERY LIGHTPATH	580

510

MIKE

200a

600

OPTICAL CLOUD

USER 1

USER 2

USER 3

****

USER n

200b

FIG. 17

FIG. 18

520

User Name: Mike

Field	Value		Field	Value
User ID	47.25.110.10 — 521		User Group	33.22.67 — 522
Node Address	47.25.111.1 — 523		Port Id	6 — 524
Channel ID	48 — 525		Sub-channel Id	56 — 526
Contract ID	1234567890 — 527		Directionality	Bi-derectional — 528
Service Type	Ethernet — 529		Bandwidth	10G — 530

OK — 531

Cancel — 532

UNI PROPERTY
REGISTER/DE-REGISTER
CONNECT/DISCONNECT
MODIFY LIGHTPATH
QUERY LIGHTPATH

520

User Name: Mike

User ID	521	47.25.110.10
User Group	522	33.22.67
Node Address	523	47.25.111.1
Port ID	524	6
Channel ID	525	48
Sub-channel ID	526	56
Contract ID	527	1234567890
Directionality	528	▷ Bi-derectional
Service Type	529	▷ ETHERNET
Bandwidth	530	▷ 10G

Register — 533

De-register — 534

UNI PROPERTY
REGISTER/DE-REGISTER
CONNECT/DISCONNECT
MODIFY LIGHTPATH
QUERY LIGHTPATH

FIG. 19

UNI PROPERTY
REGISTER/DEREGISTER
CONNECT/DISCONNECT
MODIFY LIGHTPATH
QUERY LIGHTPATH

Destination User ID — 541

47.25.110.11
47.25.111.21
47.28.10.1
55.25.45.67
101.25.233.201

540

Source Node: 47.25.110.10 — 551

Destination Node: 47.25.111.21 — 552

Bandwidth   10 G — 542

Link Type   Ethernet — 544

Signaling Type   On-demand /Scheduled — 552

Protection   Gold — 543

Max. Delay   10ms — 545

Starting Time   Minute/hour Dd/mm/yy — 596

Duration   Minute/hour Dd/mm/yy — 547

OK — 548

Cancel — 549

FIG. 20
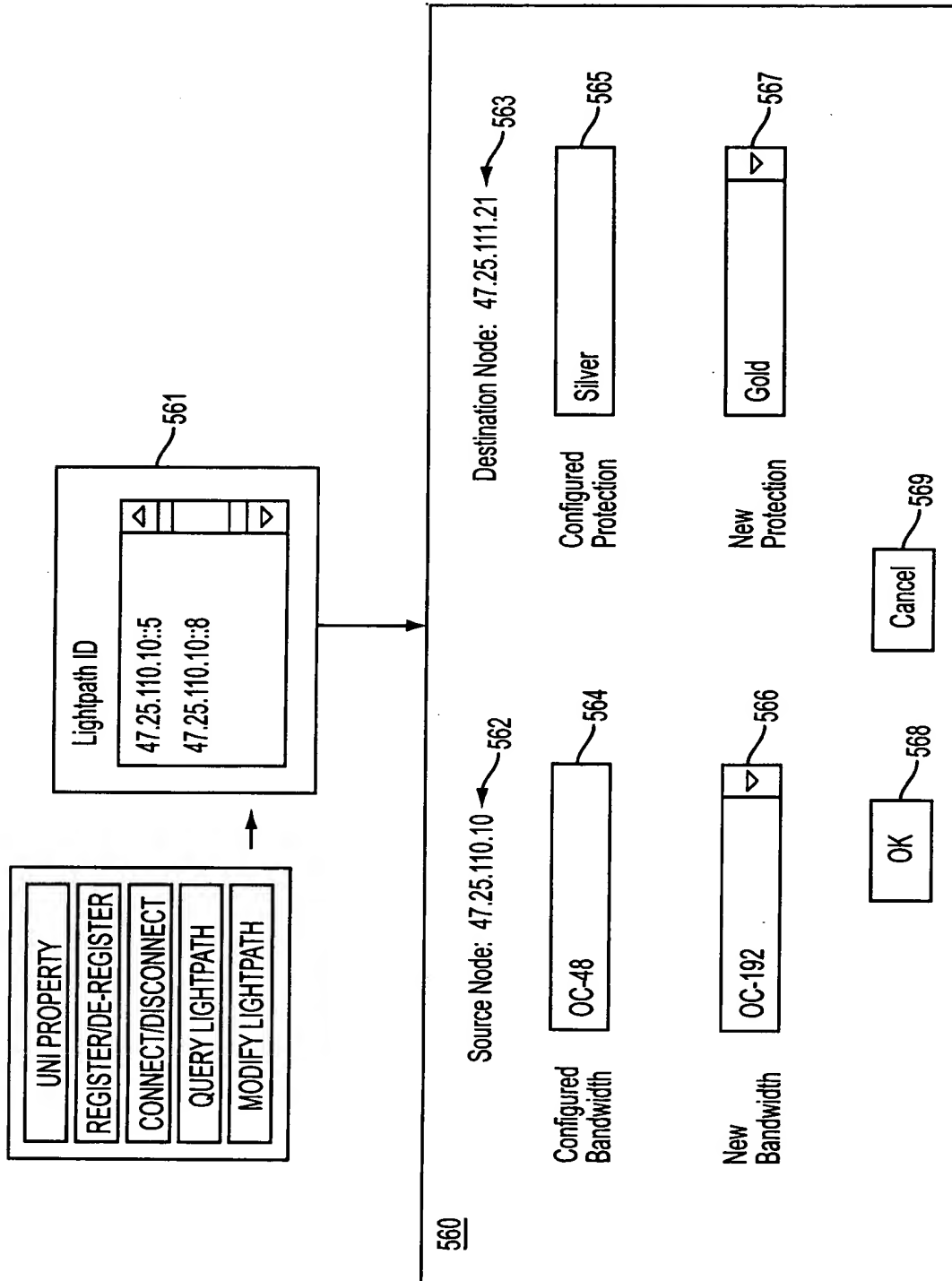
UNI PROPERTY
REGISTER/DE-REGISTER
CONNECT/DISCONNECT
QUERY LIGHTPATH
MODIFY LIGHTPATH

561

Lightpath ID

◄ ►

47.25.110.10::5
47.25.110.10::8

560

Source Node: 47.25.110.10 — 562

Destination Node: 47.25.111.21 — 563

Configured
Bandwidth   OC-48   564

Configured
Protection   Silver   565

New
Bandwidth   OC-192   ▷   566

New
Protection   Gold   ▷   567

OK — 568

Cancel — 569

FIG. 21

FIG. 22